

WHAT IS CLAIMED IS:

1. A multicarrier CDMA transmission method for multiplying transmit data individually by each code constituting orthogonal codes and transmitting each  
5 result of multiplication by a prescribed subcarrier, comprising steps of:
  - assigning a plurality of different subcarriers to each user; and
  - performing multicarrier transmission of the  
10 transmit data of a user by the subcarriers assigned.
2. A multicarrier CDMA transmission method according to claim 1, further comprising steps of:
  - assigning M-number of orthogonal codes to a user;
  - converting transmit data to parallel data  
15 comprising M-number of symbols by a serial-to-parallel conversion;
  - multiplying an ith symbol of the parallel data individually by each code constituting ith orthogonal codes;
  - 20 adding corresponding results of multiplication from among the results of multiplication obtained for every symbol; and
  - transmitting each of the results of addition by the subcarrier assigned.
- 25 3. A multicarrier CDMA transmission method according to claim 1, further comprising steps of:
  - assigning a plurality of subcarriers exclusively to each user; and
  - applying beam-forming processing user by user and  
30 transmitting transmit data to each user by the subcarriers assigned.
4. A multicarrier CDMA transmission method according to claim 1, further comprising steps of:
  - assigning a plurality of subcarriers exclusively

to each user; and

performing multicarrier transmission of the transmit data from each user by the subcarriers assigned.

- 5 5. A multicarrier transmission method for multiplying transmit data individually by each code constituting orthogonal codes and transmitting each result of multiplication by a prescribed subcarrier, comprising steps of:

- 10 assigning the same subcarriers to a plurality of users and assigning different orthogonal codes to each user; and

transmitting the transmit data of each user by performing code multiplexing on the same subcarriers.

- 15 6. A multicarrier CDMA transmission method according to claim 5, further comprising a step of applying identical transmit beam-forming processing to the transmit data of said plurality of users to which the same subcarriers have been assigned.

- 20 7. A multicarrier CDMA transmission method according to claim 1, further comprising steps of:

extracting, by filtering, a receive signal component of a frequency domain of subcarriers that have been assigned to the user; and

- 25 performing demodulation processing using the extracted receive signal component.

8. A multicarrier CDMA transmission method according to claim 1, further comprising a step of performing transmission upon dispersing subcarriers along a frequency axis by using frequency interleaving.

- 30 9. A transmitting apparatus of a mobile station in a multicarrier CDMA transmission system for multiplying transmit data individually by each code constituting orthogonal codes and transmitting each result of

multiplication by a prescribed subcarrier, comprising:

a serial/parallel converter for subjecting the transmit data to a serial-to-parallel conversion;

5 a multiplier for multiplying one symbol of parallel data, which has been obtained by the serial-to-parallel conversion, individually by each code constituting orthogonal codes that have been assigned to a user, and similarly multiplying each symbol of the parallel data individually by each code constituting  
10 other orthogonal codes that have been assigned to said user;

a combiner for combining results of multiplication by corresponding codes of each of the orthogonal codes; and

15 a transmitting unit for performing multicarrier transmission of each of the combined results by a plurality of subcarriers that have been assigned to the user.

10. A receiving apparatus of a base station in a  
20 multicarrier CDMA transmission system for multiplying transmit data individually by each code constituting orthogonal codes and transmitting each result of multiplication by a prescribed subcarrier, comprising:

a subcarrier separator for separating subcarrier  
25 components, on a per-user basis, from a receive signal; a fading compensator for performing fading compensation on a per-subcarrier basis;

a multiplier/combiner for multiplying each subcarrier component of a plurality of subcarriers that  
30 have been assigned to a user by a corresponding code from among codes constituting orthogonal codes that have been assigned to the user, combining results of multiplication, and similarly multiplying each subcarrier component by a corresponding code from among

codes constituting other orthogonal codes that have been assigned to said user and combining results of multiplication;

5 a parallel/serial converter, which accepts each of the results of multiplication and combination as parallel data, for converting this parallel data to serial data; and

a data demodulator for demodulating data based upon an output signal of said parallel/serial converter.

10 11. A transmitting apparatus of a base station in a multicarrier CDMA transmission system for multiplying user data individually by each code constituting orthogonal codes and transmitting each result of multiplication by a prescribed subcarrier, comprising:

15 an array antenna comprising a plurality of antenna elements;

a beamforming unit for applying beam-forming processing to transmit data of a user and generating transmit data for each antenna element;

20 a multiplier, which is provided for every antenna element, for multiplying one symbol of transmit data, to which the beam-forming processing has been applied, individually by each code constituting orthogonal codes that have been assigned to a user; and

25 a transmitting unit, which is provided for every antenna element, for performing multicarrier transmission of results of multiplication by a plurality of subcarriers that have been assigned on a per-user basis.

30 12. A transmitting apparatus of a base station in a multicarrier CDMA transmission system for multiplying user data individually by each code constituting orthogonal codes, outputting results of multiplication and transmitting each result of multiplication by a

prescribed subcarrier, comprising:

an array antenna comprising a plurality of antenna elements;

5 a beamforming unit for applying beam-forming processing to transmit data of a user and generating transmit data for each antenna element;

a serial/parallel converter, which is provided for every antenna element, for converting transmit data, to which the beam-forming processing has been applied, to  
10 parallel data;

a multiplier, which is provided for every antenna element, for multiplying one symbol of parallel data, which has been obtained by the serial-to-parallel conversion, separately by each code constituting  
15 orthogonal codes that have been assigned to a user and similarly multiplying each symbol of the parallel data individually by each code constituting other orthogonal codes that have been assigned to said user;

a combiner, which is provided for every antenna  
20 element, for combining results of multiplication by corresponding codes of each of the orthogonal codes; and

a transmitting unit, which is provided for every antenna element, for performing multicarrier  
25 transmission of each of the combined results by a plurality of subcarriers that have been assigned on a per-user basis.

13. A transmitting apparatus of a base station according to claim 11, wherein a plurality of identical  
30 carriers are assigned to a plurality of users, different orthogonal codes are assigned to each user, code multiplexing is performed on the same carriers on a per-antenna basis and transmit data of each user is transmitted.

14. A receiving apparatus of a mobile station in a multicarrier CDMA transmission system for multiplying transmit data individually by each code constituting orthogonal codes and transmitting each result of
- 5 multiplication by a prescribed subcarrier, comprising:
- a filter unit for extracting subcarrier components, which have been assigned to a user, from a receive signal;
  - a fading compensator for performing fading
  - 10 compensation on a per-subcarrier basis;
  - a multiplier/combiner for multiplying each subcarrier component of a plurality of subcarriers that have been assigned to a user by each code constituting orthogonal codes that have been assigned to the user,
  - 15 combining results of multiplication, and similarly multiplying each subcarrier component by each code from among codes constituting other orthogonal codes that have been assigned to the user and combining results of multiplication;
  - 20 a parallel/serial converter, which accepts each of the results of multiplication and combination as parallel data, for converting this parallel data to serial data; and
  - a data demodulator for demodulating data based
  - 25 upon an output signal of said parallel/serial converter.